

# High Capacity, High Efficiency 10 to 20 K Pulse Tube Cryocooler, Phase I

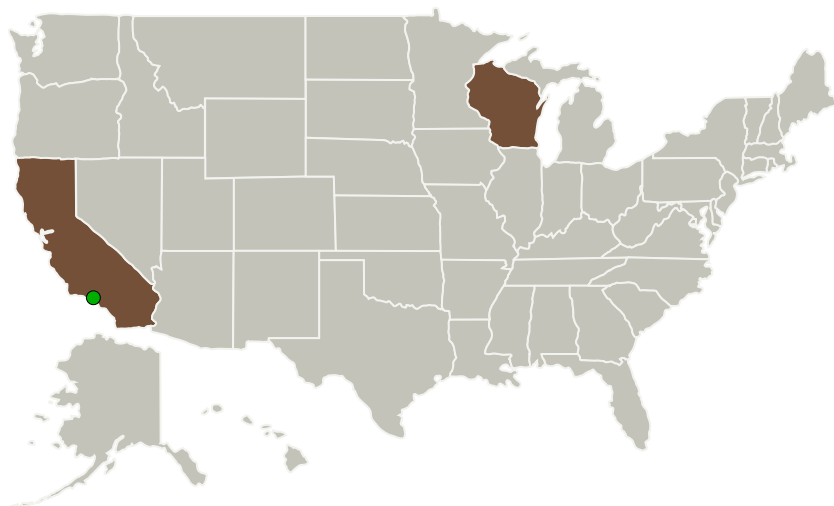
Completed Technology Project (2016 - 2016)




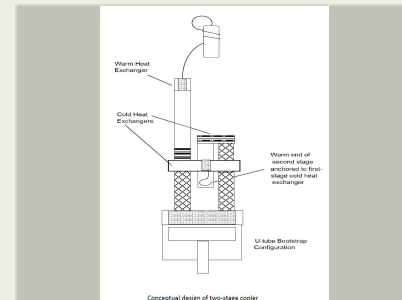
## Project Introduction

Closed-cycle cryocooler alternatives currently available for space applications in the temperature range of 10 to 20 K are not well suited to the requirements of such applications. In many cases reliability is low and vibration high. In other cases, coolers are too massive and inefficient. However, such coolers are often important components in enabling many of the advanced sensor and detector technologies of the future. This proposal describes a two-stage pulse tube cooler (PTC) that combines a bootstrap staging configuration with an innovative second-stage design to deliver cooling in the range of 10 to 20 K. The proposed cooler contains four innovative concepts that together will overcome the limitations of current cryocooler technologies and improve efficiency while simultaneously reducing mass.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Madison CryoGroup, LLC	Lead Organization	Industry	Middleton, Wisconsin
 Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California



High Capacity, High Efficiency  
10 to 20 K Pulse Tube  
Cryocooler, Phase I

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## Primary U.S. Work Locations

California

Wisconsin

## Project Transitions

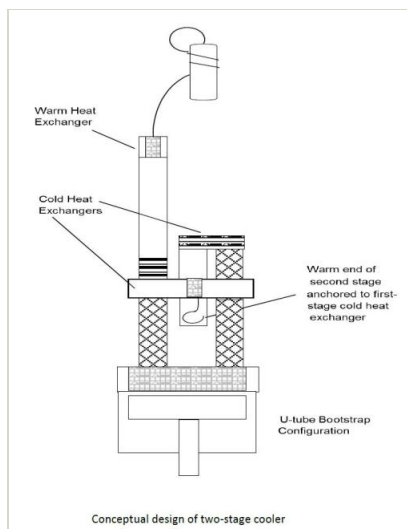
**June 2016:** Project Start

**December 2016:** Closed out

### Closeout Documentation:

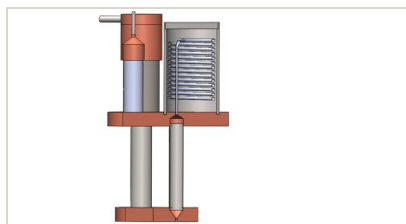
- Final Summary Chart(<https://techport.nasa.gov/file/139833>)

## Images



### Briefing Chart Image

High Capacity, High Efficiency 10 to 20 K Pulse Tube Cryocooler, Phase I  
(<https://techport.nasa.gov/image/130050>)



**Final Summary Chart Image**  
High Capacity, High Efficiency 10 to 20 K Pulse Tube Cryocooler, Phase I Project Image  
(<https://techport.nasa.gov/image/126990>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Madison CryoGroup, LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

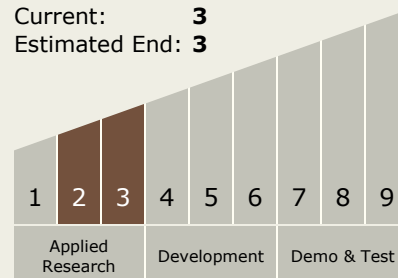
Carlos Torrez

### Principal Investigator:

James Maddocks

## Technology Maturity (TRL)

Start: **2**  
Current: **3**  
Estimated End: **3**



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## Technology Areas

### Primary:

- TX14 Thermal Management Systems
  - └ TX14.1 Cryogenic Systems
    - └ TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System